



Pharmacognostical Research

Pharmacognostical study of *Tamalaki* (*Phyllanthus fraternus* Webster), a herb used in *Tamaka-svasa*Binay Sen¹, S. D. Dubey², K. Tripathi³

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Abstract

Tamalaki is a herbacious medicinal plant, described in *Ayurvedic* texts in many occurrences with different properties, actions, uses and synonyms, supposed to indicate more than one species commonly used in practice. Modern scholars mostly suggest *Phyllanthus fraternus* Webster (syn. *P. niruri* Linn.), *P. amarus* Schum. and Thonn. and *P. urinaria* Linn. as the source plants of *Tamalaki*. In this study, an attempt has been made to designate *P. fraternus* as the source plant of *Tamalaki* used in the treatment of *Tamaka-svasa* (Bronchial asthma) and other respiratory disorders by analyzing therapeutic uses, actions, properties, taste, synonyms as well as pharmacognostical characters. Smooth capsule, six tepals, less and short fibrous root, pentagonal outline with wing-shaped young stem are some of the specific characters observed in this species.

Key words: Ayurveda, pharmacognosy, phyllanthus, synonyms, *tamalaki*

Introduction

There is considerable variation in the identity of the source plant of *Tamalaki* by different scholars. It got more than hundreds of synonyms, broad spectrum of properties, actions as well as therapeutic indices. These are the reasons behind consideration of more than one plant by different experts. It is often a difficult task to take a particular species with the name *Tamalaki* in all medicated formulations used in *Ayurveda*. Therefore, it is essential to consider the single species for specific purpose along with specification of morphological characters. A preliminary pharmacognostical study of three different species of *Tamalaki* namely *Phyllanthus fraternus*, *P. amarus*, and *P. urinaria* had been carried out by the scholar himself.^[1] In this study, *P. fraternus* has only been selected by giving more emphasize on its therapeutics in the treatment of *Tamaka-svasa*.

Literary research

In *Ayurveda*, since *Tamalaki* is attributed with *Kasahara* and *Svasahara* properties,^[2,3] *Acyaryas* have incorporated it in many formulations used for the treatment of respiratory diseases. Some of them are *Cyavanaprasa*, *Amritaprasa ghrita*, *Satyadi churna*, *Tejovatyadi ghrita*, *Kantakari ghrita*, *Padmakadi leha*,^[4]

Talisadi ghrita,^[5] and *Jivantyadi churna*.^[6,7] A single drug remedy (*Tamalaki* decoction) is found in the treatment of *Rajayakma* associated with six symptoms.^[8] In context of morphological characters, different terminologies such as *Dalaphalika*^[9,10] and *Sahapatraphala*^[11] are equated with *Tamalaki* by the ancient commentators, which signify general morphological characters observed in *Phyllanthus* species and thus identification of any particular species on this ground is not possible.

Among the *Nighantus*, it is surprisingly noticed that the source plant described in *Bhava Prakasa Nighantus* is *Tikta*, *Kasaya*, and *Madhura* in *Rasa*. The actions and indications are predominant in the respiratory system and the synonym *Ajata* ('नञ् इषदर्थे,' अल्पानि ह्रस्वानि च जटा मूलमस्याः less and short fibrous roots) suggesting toward *Phyllanthus fraternus* Webster.^[12] Some of the research works revealed that *Phyllanthus niruri* Linn. is an antihistaminic in the experimental model^[13] and clinically effective in non-bacterial upper respiratory tract infection.^[14] It has been reported that *P. niruri* Hook. f. (Fl Br Ind.) non-Linn. has been renamed as *P. fraternus* Webster in 1957.^[15] In a clinical study, it was found beneficial for the patient of *Tamaka-svasa*.^[1] *P. amarus* was investigated as hepatoprotective^[16,17] and *P. urinaria* Linn. as diuretic.^[15,18] Synonyms *Jata* ('जट झट संघाते धातोः' having more fibrous root) and *Drdhapada* ('दृढं पादं मूलं धारयति इति' hard root system) appeared in *Nighantus* indicate *P. urinaria* and *P. amarus*, respectively.^[19] On the basis of the literary research, the source plant of *Tamalaki* appeared in *Kasahara*, *Svasahara* groups, used in the treatment of *Tamaka-svasa* and other respiratory diseases, is taken as *P. fraternus*.

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Materials and Methods

Collection of plant materials and procedures

The whole plant was collected from BHU campus, Varanasi (UP, India) during the month of June–July. Macroscopic characters were established from the available source books as well as the observations made by the experts of Department of Dravyaguna and Department of Botany, BHU, followed by microscopic studies in the Pharmacognosy laboratory in Department of Dravyaguna. For a microscopic study, plant materials (root, stem, and leaf) were immersed into alcohol for 15 days to become soft and then cross sections obtained from a electronic microscope. Staining and mounting were done following the usual procedures of plant microtechnique (Jahson 1940). The respective diagram was sketched with the help of camera lucida (from slides, $\times 80$) and digital camera (from dissecting microscope, $\times 10$).

Plan of study

This study has been performed in following two divisions:

- Macroscopic study
- Microscopic study

Observations

Macroscopic study

Ayurvedic aspects

Based on the synonyms, these indicate morphological characters^[1]

तामलकी-तनुश्चासावामलकी च ।

भूम्यामलकी - भुवि आमलकी इति ।

It is thinner and smaller than *Amalaki*.

माला- मालासदृशानि फलानि यस्याः ।

The fruits (capsules) appear as beads in a string.

अत्यण्डा- अतीनि बहुनि अण्डानि बीजानि यस्याः ।

अध्यण्डा- अधिकानि अण्डानि बीजानि यस्याः ।

Having numerous (six) seeds in each capsule.

सहपत्रफला - पत्रकक्षैः फलं जायते इति ।

Capsule appears in axils of the leaf.

दलफलिका - दलेषु पत्रेषुसंलग्नानि फलानि यस्याम् ।

Capsule appears as if attached with the leaf.

अजटा - भूम्यामलकी, ह्रस्वमूलत्वात् ।

'नञ् इषदर्थे,' अल्पानि ह्रस्वानि च जटा मूलमस्याः।

Having less and short fibrous root system.

Modern aspects

Leaf: The leaf is simple, numerous, somewhat imprecated, alternate, opposite, thin and almost sessile. The upper surface is green and glabrous while the lower surface is pale green and somewhat glaucous in fresh condition,, often in two rows with a whitish rachis, elliptic-oblong shaped, margin entire, apex rounded, obtuse (rarely sub-acute), base rounded, 6–13 by 3–6 mm, unicostate reticulate venations. The main lateral nerves are usually four to five pairs, petioles very short, stipules simple, minute, free-lateral, awl-shaped, lanceolate-subulate, very acute [Figures 1a-c]. Taste is slightly bitter and odor indistinct.^[20-22]

Stem: Herbaceous, quite smooth, aerial, erect, green, branching profuse toward the upper region, 30–60 cm in height and up to 4 mm in diameter. Stem naked below with 5–11 pairs leaves bearing branches, pale green, angular, slender, and spreading. The internodes are small, 1–1.5 cm long [Figures 1a and d]. Taste is slightly bitter and odor indistinct.

Root: The taproot is more or less straight, small, 2.5–11.0 cm long, gradually tapering, with a number of whitish fibrous secondary and tertiary roots, external surface light brown, fracture short [Figure 1d].

Capsule: 2.5 mm diameter, smooth, globose, slightly depressed at the top faintly 3-lobed with six enervations, Sepals 6, enlarged more than half portion of the capsule, generally light green [Figure 1c].

Microscopic study

Stem: Transverse section of the young stem shows a pentagonal outline having a small wing-like protrusion in each angle [Figure 2a]. As the stem maturing, the protrusion becomes less pronounced and lastly becomes almost circular due to bulging out of the compressed inner mass.

Older stem shows four to five layers of cork, composed of thin-walled, tubular, tangentially elongated and radially arranged cells, filled with reddish-brown content; epidermis consists of a single layer of broad but short barrel-shaped cells with a thick cutinized outer wall. The epidermis is followed by cortex consists of a continuous

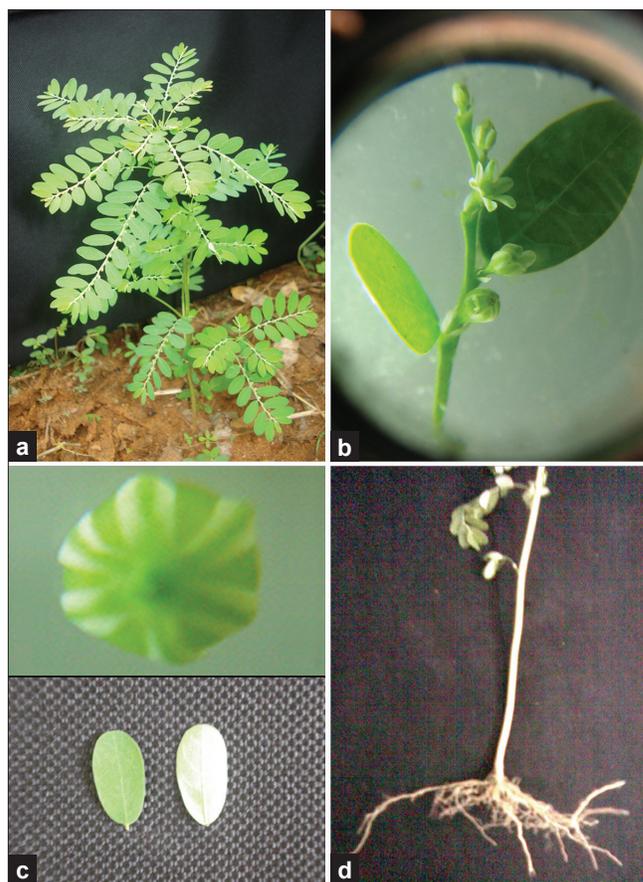


Figure 1: *Phyllanthus fraternus* Webster (a) Whole plant, (b) Flowering bud ($\times 10$), (c) Capsule (upper) Leaves ($\times 10$) (below), (d) Root (Less and short fibrous roots)

ring of collenchymatous tissue, followed by chlorenchymatous and zone of oval, tangentially elongated, thin-walled, parenchymatous cells which has prominent patches of phloem. The cells of the outer most layer of the cortex are comparatively larger and closely placed, while the cells of the innermost layer of the cortex are flattened and tangentially elongated [Figures 2b and c]; secondary phloem narrow, composed of a sieve tube, companion cells and phloem parenchyma; secondary xylem consists of vessels, tracheids, fibers, and xylem parenchyma; centre occupied by a pith composed of thin-walled, circular to oval parenchymatous cells, contain starch grains and crystals of calcium oxalate [Figures 2b-d].^[20-22]

Root: Transverse section shows four to six layers of cork, consisting of thin-walled, rectangular, tangentially elongated and radially arranged cells, filled with reddish-brown content; secondary cortex consists of 8–10 layers of thin-walled, tangentially elongated parenchymatous cells; secondary phloem is a narrow zone consists of sieve tube, companion cells and phloem parenchyma, and the whole is traversed by narrow phloem rays; secondary xylem represented by a broad zone composed of vessels, tracheids, fibers and xylem parenchyma; pith parenchymatous [Figures 3a-d].

Leaf: Transverse section of leaf shows epidermis on either side composed of thin-walled, tangentially elongated cells, covered externally by a thick cuticle; mesophyll differentiated into palisade and spongy parenchyma; palisade single-layered, occupy nearly half the space between the two epiderme; anisocytic-type stomata present on both epidermis, stomata are followed by respiratory cavities beneath; mesophyll composed of three to five layers of loosely arranged cells having a number of veins traversed in this region, a few cluster crystals of calcium oxalate present in spongy parenchyma [Figures 4a-c].^[20-22]

Discussion

Tamalaki has been in use since the *Samhita* period. Different properties, actions, and synonyms mentioned in Ayurvedic literatures indicate more than one species of it. Some experimental and clinical studies had already been carried out on different species taken as *Tamalaki* for different actions. The word *Tamalaki* thus reasonable to consider as a generic name in the present time which includes different species of *Phyllanthus*, and are subjected to further investigation for their specific action. It is observed that *P. fraternus* and *P. amarus* have six and five prominent tepals respectively, but *P. urinaria* got very minute six tepals. Capsule of *P. urinaria* is echinatus, whereas rest two is smooth. Short and less fibrous (*Ajata*), relatively more fibrous (*Jata*) root system and hard tap root *Drdhapada*, are seen in *P. fratrms*, *P. urinaria*, and *P. amarus*, respectively.

Conclusion

P. fraternus is reasonable to consider as a source plant of *Tamalaki* used in the treatment of *Tamaka svasa*. Profuse branching toward the upper region of stem, whitish rachis, elliptic-oblong leaf, smooth capsule with six tepals, less and short fibrous root system, pentagonal outline with wing-shaped young stem are some of the specific characters observed in this herb.

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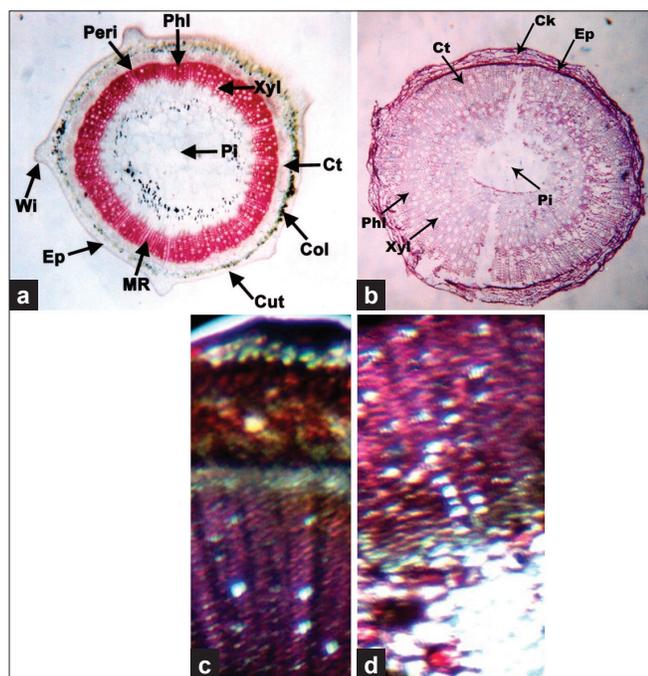


Figure 2: Microscopy (a) T. S. of young stem (x10), (b) T. S. of mature stem (x80), (c) T. S. Stem (outer) (x367), (d) T. S. Stem (Inner) (x367)

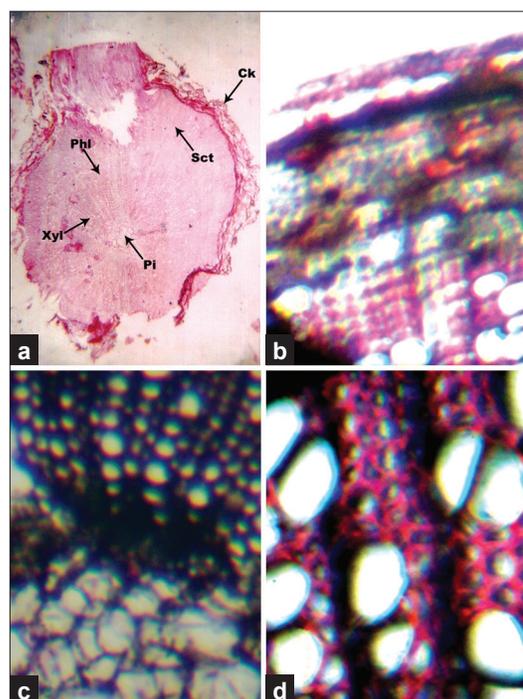


Figure 3: Microscopy (a) T. S. of root (x80), (b) T. S. root (outer) (x367), (c) T. S. root (inner) (x367), (d) Xylem cells (x367)

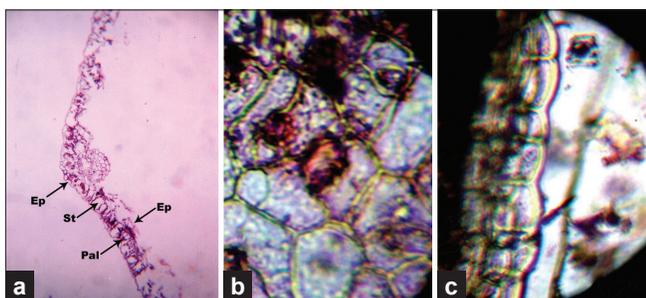


Figure 4: (a) T. S. of leaf (x80), (b) Stomata cells (x367), (c) Leaf margin (x367)

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हिन्दी सारांश

तमक श्वास में उपयोगी वनस्पति तामलकी (फाईलन्थस फ्रटर्नस वेबस्टर) का नामरूपात्मक अध्ययन

बिनय सेन, एस. डी. दूबे, के. त्रिपाठी

आयुर्वेद शास्त्र में तामलकी के अनेक पर्याय, गुण, कर्म तथा रोगों में प्रयोग वर्णित हैं। आधुनिक ग्रन्थकार ने तामलकी से फाईलन्थस की विभिन्न प्रजातियों को ग्रहण किया है। अनुसन्धान से भी भिन्न भिन्न फाईलन्थस प्रजातियों की विशेष कार्मुकता सिद्ध हुई है। शोध कार्य में पाया गया है कि तमक श्वास तथा अन्य श्वसन प्रणाली सम्बन्धित विकारों में प्रयुक्त तामलकी का शास्त्रीय स्वरूप (पर्याय, गुण, कर्म इत्यादि) फाईलन्थस वेबस्टर से मिलता है। प्रस्तुत अध्ययन में उक्त प्रजाति का नामरूप आयुर्वेद एवं आधुनिक दृष्टि से स्थापित करने का प्रयास किया गया है।